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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/564,069	01/10/2006	Masakazu Kawai	SAT-16401	5996

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EXAMINER	
SAMPLE, JONATHAN L	

ART UNIT	PAPER NUMBER
3664	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/564,069	KAWAI ET AL.	
	Examiner	Art Unit	
	Jonathan Sample	3664	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _07 May 2009_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-13_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-13_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _10 January 2006_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Receipt is acknowledged of the Information Disclosure Statements (IDS) filed on 10 January 2006 and 19 February 2009, respectively, which have been entered in the file. Claims 1-13 are pending in the instant application.

Response to Arguments

1. Applicant's arguments with respect to claims 1-13 have been considered but are moot in view of the new ground(s) of rejection. Due to a typographical error presented in the first office action on the merits, with respect to the prior art publication number, a second non-final rejection is provided herewith.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. **Claims 1-13** are rejected under 35 U.S.C. 102(e) as being anticipated by Kawai et al (US 2004/0206164 A1).

The applied reference has common inventors with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the

reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Regarding claim 1, Kawai et al teaches a joint moment estimation method for a two- legged walking mobile body, for estimating a joint moment acting on at least one joint of each leg of the two-legged walking mobile body by using a rigid link model in which the two-legged walking mobile body is represented as a link body where a plurality of rigid elements are coupled together by a plurality of joint elements including at least joint elements corresponding to a hip joint and a knee joint of each leg of the two-legged walking mobile body, the method comprising: a first step of sequentially grasping displacements of the respective joints of the two-legged walking mobile body corresponding to the respective joint elements of the rigid link model (see paragraphs 23, 47, 80 and 163); a second step of sequentially grasping values in a body coordinate system of an acceleration vector of the origin of the body coordinate system, which has been preset as a coordinate system fixed to and tilting with one predetermined rigid element of the rigid link model, by using at least an output of an acceleration sensor (Figure 2, accelerometers 15, 20 and 21) attached to the two- legged walking mobile body (see paragraphs 41, 42 and 164); a third step of sequentially grasping values in the body coordinate system of a floor reaction force vector acting on each leg of the two-legged walking mobile body (Figure 3, floor reaction force estimating means 38 and paragraphs 20, 25 and 89); a fourth step of sequentially grasping values in the body coordinate system of a position vector of a point of application of the floor reaction force vector (Figures 5 and 6, also see paragraphs 52 and 116-119); and a fifth step of

sequentially estimating joint moments acting on at least one joint of each leg of the two-legged walking mobile body on the basis of an inverse dynamics model representing a relation between a motion of each rigid element of the rigid link model and a translational force and moment acting on the rigid element in the body coordinate system by using the displacements of the respective joints of the two-legged walking mobile body grasped in the first to fourth steps, the value of the acceleration vector of the origin in the body coordinate system, the value of the floor reaction force vector, and the value of the position vector of the point of application of the floor reaction force vector (Figure 3, joint moment estimating means 37 and see paragraphs 47, 52 and 145).

Regarding claim 2, wherein the acceleration sensor is attached to a rigid equivalent part of the two-legged walking mobile body corresponding to the rigid element to which the body coordinate system is fixed (see paragraphs 42, 44, 78 and 79).

Regarding claim 3, wherein the rigid element to which the body coordinate system is fixed is a rigid element connecting a pair of joint elements corresponding to a pair of hip joints of the two- legged walking mobile body (see paragraphs 40, 47 and 84).

Regarding claim 4, wherein the method further comprises: a sixth step of sequentially calculating values in the body coordinate system of a position vector of an total center-of-gravity of the two-legged walking mobile body by using the displacements of the respective joints of the two-legged walking mobile body grasped in the first step

and the rigid link model (see paragraphs 20, 47, 49 and 86); a seventh step of sequentially grasping values in the body coordinate system of the acceleration vector of the total center-of-gravity from time-series data of the value of the position vector of the total center-of-gravity and the value of the acceleration vector of the origin of the body coordinate system grasped in the second step (see paragraphs 112-114); and an eighth step of sequentially determining whether the motion state of the two-legged walking mobile body is a one-leg supporting state in which only one leg of a pair of legs is landing or a two-leg supporting state in which both legs are landing (see paragraph 20), wherein the third step includes: estimating the value in the body coordinate system of the floor reaction force vector on the basis of the equation of motion of the total center-of-gravity of the two-legged walking mobile body represented by the value of the acceleration vector of the total center-of-gravity calculated in the seventh step, the total weight of the two-legged walking mobile body, and the floor reaction force vector acting on the landing leg if the motion state of the two-legged walking mobile body is the one-leg supporting state (see paragraphs 14, 20 and 21); and grasping the values in the body coordinate system of the floor reaction force vectors acting on both legs respectively on the basis of the equation of motion of the total center-of-gravity of the two- legged walking mobile body represented by the value of the acceleration vector of the total center-of-gravity calculated in the seventh step, the total weight of the two-legged walking mobile body, and the floor reaction force vectors acting on the both legs respectively and a relational expression between a relative position of a specific portion of each of the legs to the total center-of-gravity of the two-legged walking mobile body,

which is determined on the assumption that the floor reaction force vector acting on the leg is a vector acting from the specific portion predetermined in the vicinity of the lower end of the leg toward the total center-of- gravity of the two-legged walking mobile body, and the floor reaction force vector acting on the leg if the motion state of the two-legged walking mobile body is the two-leg supporting state (see paragraphs 111-114 and 145-147).

Regarding claim 5, wherein the method further comprises: a ninth step of sequentially grasping tilt angles to the vertical direction of the rigid equivalent part of the two-legged walking mobile body corresponding to the rigid element to which the body coordinate system is fixed (Figure 2 and see paragraph 85 and 86); a tenth step of determining whether or not the leg is landing for each of the legs of the two- legged walking mobile body (see paragraphs 20-22); an 11th step of grasping at least a value in the body coordinate system of the position vector of the total center-of-gravity of the two-legged walking mobile body, a value in the body coordinate system of the position vector of the ankle joint of the landing leg, and a value in the body coordinate system of the position vector of a metatarsophalangeal joint of the foot of the leg by using the displacements of the respective joints of the two-legged walking mobile body grasped in the first step and the rigid link model (see paragraphs 86, 116 and 119). It is interpreted that the metatarsophalangeal joint of the foot corresponds to the hell and toe portions of the each foot; a 12th step of grasping at least the positional relationship among the total center-of-gravity, the ankle joint of the landing leg, and the metatarsophalangeal joint of the foot of the leg and the vertical position of the ankle joint of the leg on the basis of the

position vector values of the total center-of-gravity, the ankle joint of the landing leg, and the metatarsophalangeal joint of the foot of the leg having been grasped and the tilt angle grasped in the ninth step (see paragraphs 145-149); and a 13th step of estimating a horizontal in-plane position of the point of application of the floor reaction force vector acting on the landing leg on the basis of the grasped positional relationship among the total center-of- gravity, the ankle joint of the landing leg, and the metatarsophalangeal joint of the foot of the leg and estimating the vertical position of the point of application of the floor reaction force vector acting on the leg on the basis of the vertical position of the ankle joint of the leg, wherein the fourth step includes a step of grasping a value of the position vector of the point of application of the floor reaction force vector in the body coordinate system on the basis of the horizontal in- plane position and the vertical position of the point of application of the floor reaction force vector estimated in the 13th step and the tilt angle grasped in the ninth step (see paragraphs 116- 119 and 140-142).

Regarding claim 6, wherein: the values of the floor reaction force vector and the position vector of the point of application of the floor reaction force vector grasped in the third step and the fourth step, respectively, are three-dimensional values (see paragraphs 20 and 84). It is interpreted that the values of the floor reaction force vector and the position vector of the point of application of the floor reaction force vector are determined in a body coordinate system, which is established as a three-dimensional coordinate system, which in turn would imply three- dimensional values; and the 13th step includes a step of: estimating the horizontal in-plane position of the ankle joint of

the landing leg as the horizontal in-plane position of the point of application of the floor reaction force vector acting on the leg if the total center-of- gravity is more backward than the ankle joint of the landing leg in the forward/backward direction of the two-legged walking mobile body; estimating the horizontal in-plane position of the metatarsophalangeal joint of the foot of the landing leg as the horizontal in-plane position of the point of application of the floor reaction force vector acting on the leg if the total center-of- gravity is more forward than the metatarsophalangeal joint of the foot of the landing leg in the forward/backward direction of the two-legged walking mobile body; and estimating the horizontal in- plane position of the point whose position in the forward/backward is coincident with the total center-of-gravity on the line segment connecting the ankle joint with the metatarsophalangeal joint of the landing leg as a horizontal in-plane position of the point of application of the floor reaction force vector acting on the leg if the total center-of-gravity is more forward than the ankle joint of the landing leg in the forward/backward direction of the two-legged walking mobile body and is more backward than the metatarsophalangeal joint of the foot of the leg (see paragraphs 84, 116 and 142). It is interpreted from the teachings of Kawai et al that the horizontal-in-plane position of the ankle joint, metatarsophalangeal joint, or the horizontal in- plane position of the point whose position in the forward/backward is coincident with the total center-of-gravity on the line segment connecting the ankle joint with the metatarsophalangeal joint of the landing leg may be estimated based on the location of the total center of gravity in conjunction with the point of application of the floor reaction force vector acting on the leg.

Regarding claim 7, wherein the 13th step includes a step of estimating the vertical position of the point of application of the floor reaction force vector acting on the landing leg as a position located a predetermined value apart from the vertical position of the ankle joint of the leg grasped in the 12th step downward in the vertical direction (see paragraphs 103, 117 and 162).

Regarding claim 8, wherein: the 10th step includes a step of determining whether each of the toe-side portion and the heel-side portion of the foot of the leg is in contact with the ground regarding the leg determined to be landing (see paragraphs 116-119). It is interpreted that based on the point of application, it can be determined whether the toe-side portion or the heel-side portion of the foot of the leg is in contact with the ground; the 12th step includes a step of grasping the vertical position of the metatarsophalangeal joint of the foot of the leg in addition to the vertical position of the ankle joint of the landing leg (see paragraphs 116-119). It is interpreted that the vertical position of the metatarsophalangeal joint as well as the vertical position of the ankle joint may be attained in the same way that the thigh position is grasped; and the 13th step includes a step of estimating the vertical position of the point of application of the floor reaction force vector by using a distance in the vertical direction between the ankle joint and the metatarsophalangeal joint obtained from the vertical position of the ankle joint and the vertical position of the metatarsophalangeal joint grasped in the 12th step, instead of the predetermined value, if only the toe-side portion is determined to be in contact with the ground among the toe-side portion and the heel-side portion of the foot in the 10th step (see paragraphs 23, 24 and 116-119). It is interpreted from the

teachings of Kawai et al that estimating the vertical position of the point of application of the floor reaction force vector by using a distance in the vertical direction between the ankle joint and the metatarsophalangeal joint, may be programmed to determine the floor reaction force vector, if the point of application of the foot, whether the toe-side portion or the heel-side portion of the foot is determined to be in contact with the ground.

Regarding claim 9, wherein the value of the floor reaction force vector and the value of the position vector of the point of application of the floor reaction force vector respectively grasped in the third step and the fourth step are three-dimensional values (see paragraphs 20 and 84). It is interpreted that the values of the floor reaction force vector and the position vector of the point of application of the floor reaction force vector are determined in a body coordinate system, which is established as a three-dimensional coordinate system, which in turn would imply three- dimensional values.

Regarding claim 10, wherein the 13th step includes a step of estimating the vertical position of the point of application of the floor reaction force vector acting on the landing leg as a position located a predetermined value apart from the vertical position of the ankle joint of the leg grasped in the 12th step downward in the vertical direction (see paragraphs 103, 117 and 162).

Regarding claim 11, wherein: the 10th step includes a step of determining whether each of the toe-side portion and the heel-side portion of the foot of the leg is in contact with the ground regarding the leg determined to be landing (see paragraphs 116-119). It is interpreted that based on the point of application, it can be determined

whether the toe-side portion or the heel-side portion of the foot of the leg is in contact with the ground; the 12th step includes a step of grasping the vertical position of the metatarsophalangeal joint of the foot of the leg in addition to the vertical position of the ankle joint of the landing leg (see paragraphs 116-119). It is interpreted that the vertical position of the metatarsophalangeal joint as well as the vertical position of the ankle joint may be attained in the same way that the thigh position is grasped; and the 13th step includes a step of estimating the vertical position of the point of application of the floor reaction force vector by using a distance in the vertical direction between the ankle joint and the metatarsophalangeal joint obtained from the vertical position of the ankle joint and the vertical position of the metatarsophalangeal joint grasped in the 12th step, instead of the predetermined value, if only the toe-side portion is determined to be in contact with the ground among the toe-side portion and the heel-side portion of the foot in the 10th step (see paragraphs 103, 119 and 132-134). It is interpreted from the teachings of Kawai et al that estimating the vertical position of the point of application of the floor reaction force vector by using a distance in the vertical direction between the ankle joint and the metatarsophalangeal joint, may be programmed to determine the floor reaction force vector, if the point of application of the foot, whether the toe-side portion or the heel-side portion of the foot is determined to be in contact with the ground.

Regarding claim 12, wherein the value of the floor reaction force vector and the value of the position vector of the point of application of the floor reaction force vector respectively grasped in the third step and the fourth step are three- dimensional values

(see paragraphs 20 and 84). It is interpreted that the values of the floor reaction force vector and the position vector of the point of application of the floor reaction force vector are determined in a body coordinate system, which is established as a three-dimensional coordinate system, which in turn would imply three- dimensional values.

Regarding claim 13, wherein the value of the floor reaction force vector and the value of the position vector of the point of application of the floor reaction force vector respectively grasped in the third step and the fourth step are three- dimensional values (see paragraphs 20 and 84). It is interpreted that the values of the floor reaction force vector and the position vector of the point of application of the floor reaction force vector are determined in a body coordinate system, which is established as a three-dimensional coordinate system, which in turn would imply three- dimensional values.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See attached PTO-892 – Notice of References Cited form.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Sample whose telephone number is (571)270-5925. The examiner can normally be reached on M-F 7-3.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Khoi Tran can be reached on 571-272-6919. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. S./
Examiner, Art Unit 3664

21 July 2009
/KHOI TRAN/
Supervisory Patent Examiner, Art Unit 3664